

SHEET INDEX

CONTENTS	SHEET NO.	SHEET ISSUE
SHEET INDEX SYMBOL: MANUFACTURING REFERENCES NOTES USED-ON TABLE CURRENT DRAIN RECORD OF CHANGES	1	2
CIRCUIT SCHEMATIC	2	2
COMPONENT LIST CIRCUIT DESCRIPTION	3	2
	4	2

SYMBOL
TAPE UNIT CONTROLLER
BOARD A
ELEMENT IDENT
A

TERM.	MOD	FUNCT.	TERM.	LOC.	TERM.	MOD	FUNCT.	TERM.	LOC.
ALBCV0	I	009	3A2		FSFBRCC0	BT	210	2H5	
ALBCV1	I	118	3A1		FSFTRCC0	BT	112	2H5	
JBSTSP0	I	028	3A3		FW00	BT	207	2H3	
INF010	I	101	2A1		INF000	BT	201	3A8	
INF040	I	002	2A1		INF020	BT	202	3A8	
INF050	I	102	2A1		INF030	BT	302	3A8	
INF070	I	008	2A7		INF080	BT	217	3A4	
INF10	I	219	2A7		INF090	BT	212	2A5	
LBENH1	I	304	3A7		INF100	BT	213	2A4	
PSTAT1	I	001	3A0		INF110	BT	214	2A6	
RED	I	103	2A0		INF120	BT	115	3A5	
RQJNG080	I	019	3A3		INF130	BT	015	3A6	
STBP00	I	113	2A0		INF180	BT	205	2H7	
TM00	I	106	2A3		INF190	BT	007	3H7	
WTRK10	I	105	2A9		WTRK10H1	BT	006	2H3	
WTRK10	I	110	2A3		WTRK10	BT	010	2H5	
CLBRCC0	BT	311	2H6		RESC00	BT	011	2H5	
GR00	BT	004	2H0		TRCK001	BT	300	3H5	
ENR01	BT	11A	2H0		TRCK011	BT	303	3H5	
INF140	BT	203	3H4		TTTT1	BT	013	2H3	
INF150	BT	204	3H1		TTTT1	BT	108	2H1	
WTRK10	BT	305	3H7		TTTT1	BT	014	2H1	
ROCL0	BT	215	2H0		TTTT1	BT	118	2H3	
REVO	BT	208	2H2		TUCRC1	BT	301	2H0	
RTA00	BT	117	3H5		WENR00	BT	109	2H1	
RTA10	BT	317	3H6		WENR01	BT	003	2H2	
RATSP0	BT	313	2H6		WTRK10	BT	104	2H8	
STTCC0	BT	312	2H6		WTRK10	BT	005	2H8	
STBP00	BT	012	2H6		+S	P	000,119	3G7	
STRCC0	BT	310	2H6		GR0	G	200,319	3G7	
SATSP0	BT	314	2H6						
TTTT0	BT	216	2H4						
TTTT0	BT	016	2H5						
TTTT0	BT	209	2H8						
TTTT0	BT	209	2H6						
TTTT0	BT	111	2H6						
TTTT0	BT	315	3H7						
TTTT0	BT	116	2H4						
TTTT0	BT	316	2H4						
TUCR00	BT	271	2H0						
WTRK10	BT	107	2H1						
WTRK10	BT	100	2H2						
WTRK10	BT	218	3H5						
WTRK10	BT	017	3H6						

RECORD OF CHANGES

DWG	REV	DATE	BY	APP	NOTE

SYSTEM USED ON	DESIGN CONTROL
COMMON SYSTEMS	1H

CURRENT DRAIN: 325mA

NOTES:

1. GROUND RETURN
2. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL "P" (PLUS) OR "M" (MINUS) ARE IN VOLTS.

3. BATTERY AND GROUND TERMINALS FOR INTEGRATED CIRCUITS

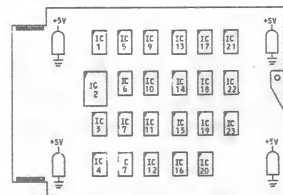
IC CODE	BAT. TERM.	GRD TERM.
AT10	16	8
AT15	1	7, 9
AT18	1	8
AT19	7, 8	
AT20	8	
AT21	8	
AT22	7, 8	
AT23	8	
AT24	9	8
AT25	16	8
AT26	24	12

4. BATTERY AND GROUND TERMINALS FOR THIS CIRCUIT PACK ARE AS FOLLOWS:

LINE CODE	TERMINAL
+S	000,119
GRD	200,319

5. HORIZONTAL MOUNTING CENTERS AT 0.50 INCH.

6. INTEGRATED CIRCUIT LOCATION GUIDE: (COMPONENT SIDE SHOWN)



UNMARKED COMPONENTS ARE 1/4W FILIP CAPACITORS

SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	JK16
CONNECTOR ON FRAME	947C OR 947A
ACCEPTABLE SERIES	1-2, 2

SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE FIRST SHEET.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE FIRST SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.

NOTICE - NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL SYSTEM EXCEPT UNDER WRITTEN AGREEMENT.

ISSUE
2A

JK16 CIRCUIT PACK

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A CIRCUIT

1968

AT&T

STANDARD

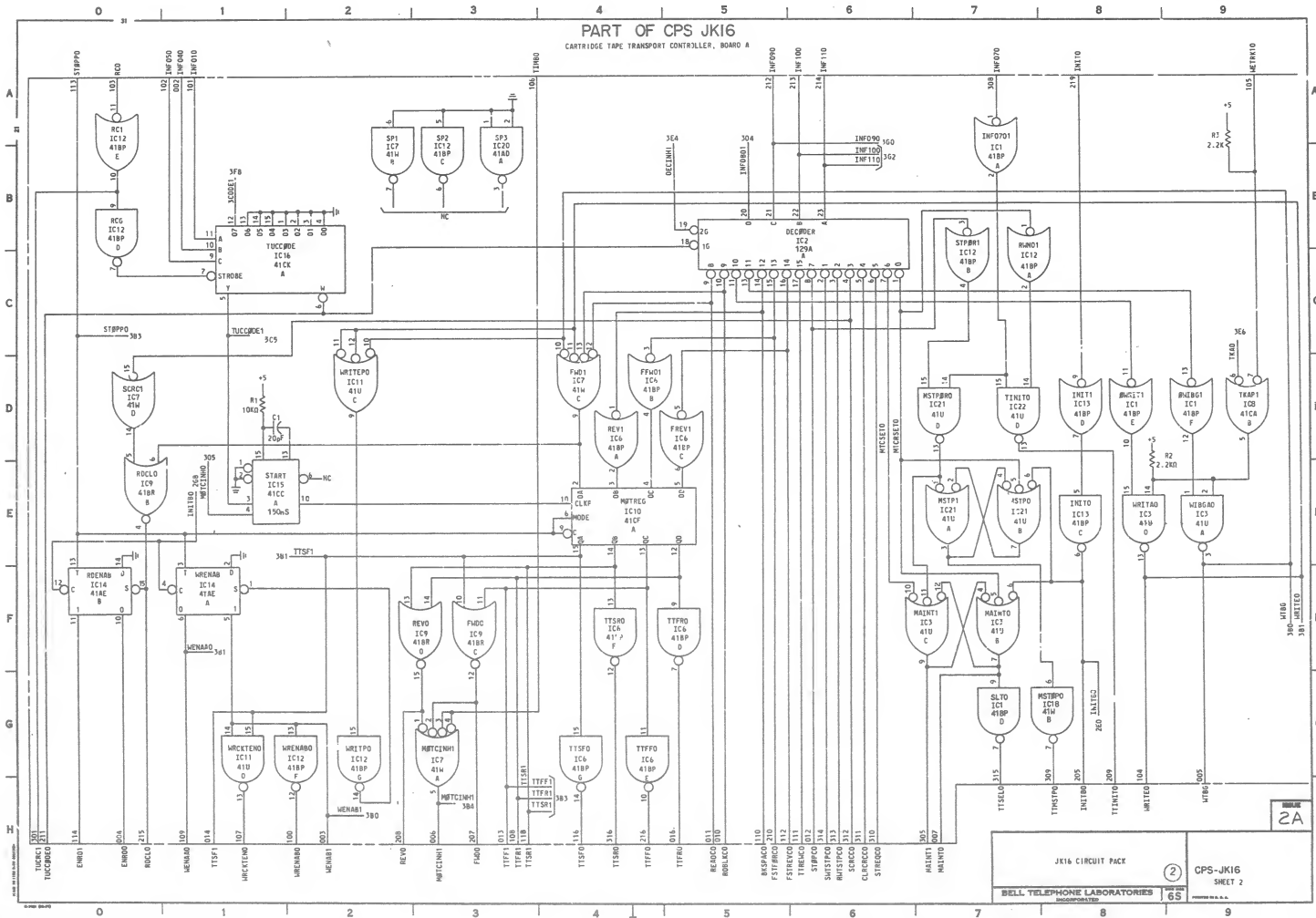
2

CPS-JK16
A SHEETS

BELL TELEPHONE LABORATORIES

65

PART OF CPS JK16 CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A



CPS-JK16

JK16 CIRCUIT PACK

2

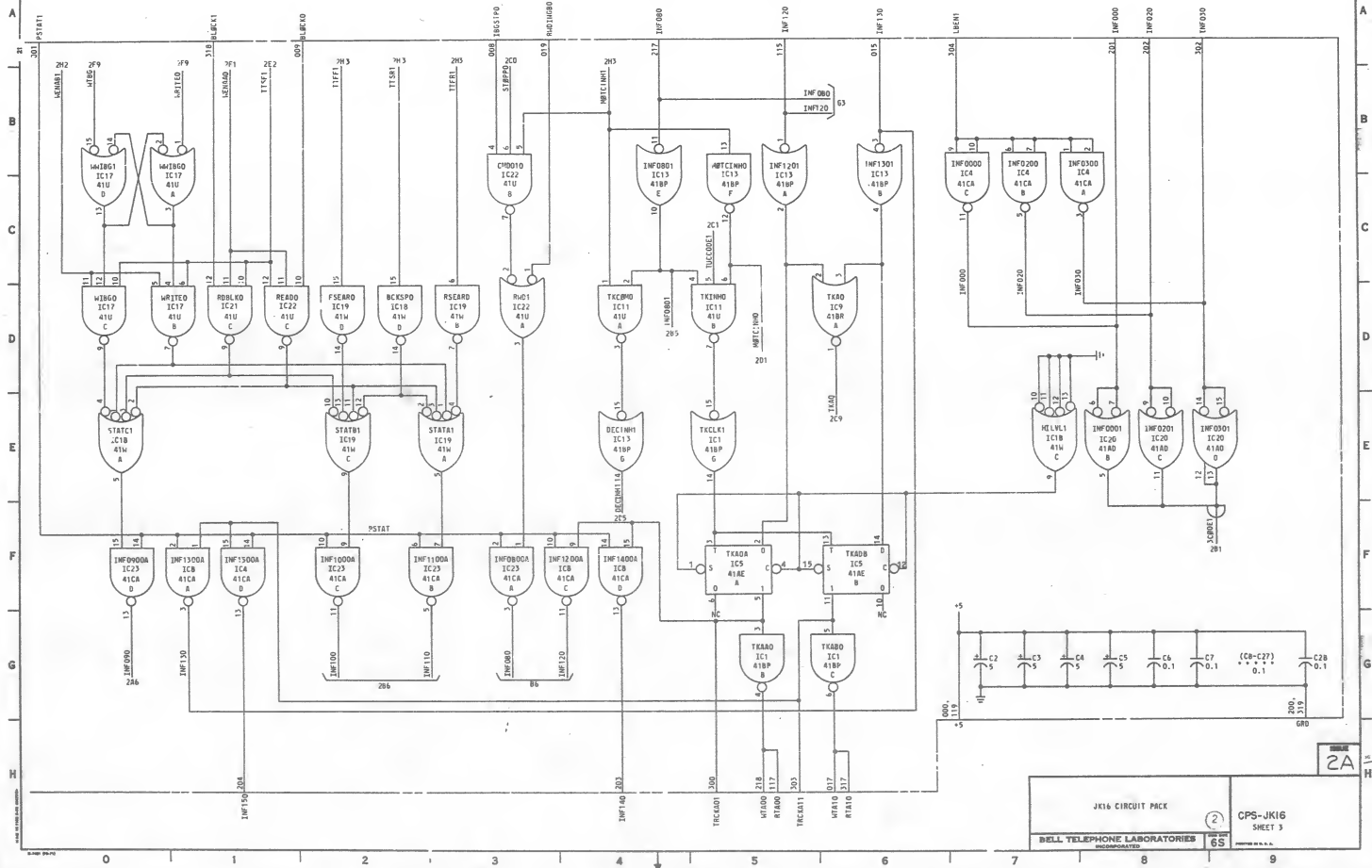
CPS-JK16
SHEET 2

BELL TELEPHONE LABORATORIES

66

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A



PART OF CPS JK16

CARTIDGE TAPE TRANSPORT CONTROLLER, BOARD A

COMPONENT LIST

INTEGRATED CIRCUIT

LOC CODE ELEM	IC1 418P	IC2 124A	IC3 41U	IC4 41CA	IC5 41AE	IC6 41BP	IC7 41W	IC8 41CA	IC9 41BR	IC10 41CF	IC11 41U	
	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	INP001	287	DECODER	285	INP002	288	TKAR0	375	REVI	204	INP100A	371
B	TKAR0	365			INP003	387	TKAR0	376	FW01	204	TKAR1	209
C	TKAR0	366			INP004	387	TKAR0	376	FW01	205	INP1200A	374
D	SLT0	267			INP005	387	TKAR0	376	FW01	204	INP1200A	374
E	INP001	287			INP006	387	TKAR0	376	FW01	204	INP1400A	374
F	INP001	287			INP007	387	TKAR0	376	FW01	204	INP1400A	374
G	TKAR1	365			INP008	387	TKAR0	376	FW01	204	INP1400A	374

LOC CODE	IC12 41BP	IC13 41BP	IC14 41AE	IC15 41CC	IC16 41CC	IC17 41U	IC18 41W	IC19 41W	IC20 41BD	IC21 41U	IC22 41U	IC23 41CA
ID	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC	DESIG	SH LOC
A	INP001	287	INP100A	371	INP002	288	TKAR0	375	INP003	387	TKAR0	376
B	TKAR0	365	INP100A	371	INP003	387	TKAR0	376	INP004	387	TKAR0	376
C	SP2	282	INP100A	371	INP004	387	TKAR0	376	INP005	387	TKAR0	376
D	RC0	280	INP100A	371	INP005	387	TKAR0	376	INP006	387	TKAR0	376
E	RC1	280	INP100A	371	INP006	387	TKAR0	376	INP007	387	TKAR0	376
F	INP001	287	INP100A	371	INP007	387	TKAR0	376	INP008	387	TKAR0	376
G	INP001	287	INP100A	371	INP008	387	TKAR0	376	INP009	387	TKAR0	376

CAPACITOR

DESIG	CODE
C1	KS-19774 L1,20u
[24] C2-C5	801A, 5
[45] C6-C8	KS-19774 L5,0.1

RESISTOR

DESIG	CODE
R1	KS-20614 L1A,100
R2	KS-20614 L1A,2.20
R3	KS-20614 L1A,2.20

CIRCUIT DESCRIPTION:

THIS CIRCUIT PACK IS ONE OF FOUR ASSOCIATED WITH THE CARTIDGE TAPE TRANSPORT CONTROLLER PORTION OF THE TDC CIRCUIT. IT CONTAINS THE COMMAND DECODER, MOTION CONTROL, TRACK SELECTION, READ AND WRITE ENABLE REGISTERS, PRIMARY STATUS, AND MAINTENANCE CIRCUITS.

THE 41CC, TUC000E, AND ASSOCIATED GATES, INP001, INP002, AND INP003 ARE USED TO RECOGNIZE THE PROPER 3-V6 DEVICE CODE AND MINIMIZE LOADING ON THE SPI PARALLEL BUS. USING THE INPUT R0 AS A STORE, THIS CIRCUITRY INITIATES ALL COMMANDS WHICH DO NOT CARRY THE PROPER DEVICE CODE. OUTPUTS FROM TUC000E STORE THE 12-PA COMMAND DECODER. FROM INPUTS INP001, INP002, AND INP003, THE COMMAND DECODER DECODES PULSES ONE OF ITS 16 OUTPUT COMMAND LEADS. THE 16 COMMANDS ARE: READ CONTINUOUS (READ), READ-ONE-BLOCK (R0BLOC), WRITE (FEED), WRITE-1, WRITE TWO (FEED), BACKSPACE (BKSPAC), FAST FORWARD (FSTFW00), FAST REVERSE (FSTR00), REWIND (RTW00), STOP (ST00P), SET WRITE STOP (SETWSTOP), RESET WRITE STOP (R0WSTOP), CLEAR CIRC (CLR CIRC), STATUS REQUEST (STR00Q), SET MAINTENANCE (MNT000), AND RESET MAINTENANCE (MNT000). COMMANDS LISTED ABOVE WHICH REQUIRE ANY OF THE FOLLOWING MOTIONS OF THE TRANSPORT, SLOW FORWARD, SLOW REVERSE, FAST FORWARD, OR FAST REVERSE, FEED PAUL, REVI, FEED1, AND FEED2, RESPECTIVELY. THE OUTPUTS FROM THESE GATES FEED THE 41CC, INP003, WHICH IS THE TAPE MOTION CONTROL REGISTER. THE 41CC, START, WHICH IS TRIGGERED BY TUC000E, STROBES W000E APPROXIMATELY 150 ns AFTER DECODER IS STROBED. THIS RELAY PROVIDES SETUP TIME FOR COMMANDS FROM THE DECODER. THE T000E, T000E, AND T000E, AND FEED DIRECTLY TO THE TRANSPORT. A STOP COMMAND OR A LOW OF SEVERAL OTHER CONDITIONS ON J001 WILL CAUSE ST00P TO PULSE LOW. THE LEADING EDGE OF THIS PULSE CLEARS MNT000. LEAD INP003 IS USED TO DECODE MOTION COMMANDS. IT MUST BE IN A LOW STATE FOR THE 12-PA TO DECODE ANY OF THE EIGHT COMMANDS WHICH REQUIRE TRANSPORT MOTION. MNT000 REMAINS IN A HIGH STATE IF ANY OF THE FOUR MOTION STATES ARE SET IN INP003. NOTE THAT IF INP003 IS IN A LOW STATE AND MNT000 IS IN A HIGH STATE, THEN DECENT WILL BE IN A HIGH STATE WHICH INHIBITS THE 12-PA DECODER. THIS CIRCUITRY REQUIRES THAT THE TRANSPORT BE IN A STOP STATE BEFORE ANY MOTION COMMAND CAN BE DECODED. THE EIGHT COMMANDS WHICH DO NOT REQUIRE MOTION ARE DECODED IRRESPECTIVE OF THE STATE OF MNT000.

READ AND WRITE OPERATIONS ARE CONTROLLED BY TWO 0-TYPE FLIP-FLOPS, R0BLOC AND R0W000, RESPECTIVELY. NOTE THAT ALL COMMANDS REQUIRING SLOW FORWARD MOTION OF THE TRANSPORT (HIGH STATE OF F001) WILL SET R0BLOC.

A SHIFT CHC COMMAND ALSO SETS R0BLOC. A WRITE OR WRITE TWO COMMAND, WHICH SETS BOTH R0BLOC AND R0W000 TO CREATE A READ AFTER WRITE CONDITION, IS GATED THROUGH W000E OR W000E BY T000E. T000E IS ACTIVE, OR IN A HIGH STATE, WHEN EITHER MNT000 OR T000E IS IN A LOW STATE. LEAD MNT000 REMAINS HIGH TO WRITE PROTECT INFORMATION ON THE TAPE PROGRAM TRACK, TRACK 1. T000E IS IN A HIGH STATE ONLY WHEN BOTH INP002 AND INP003 ARE IN HIGH STATES. A HIGH STATE ON BOTH INP002 AND INP003 INDICATE THE SELECTION OF TRACK 1.

GATED INP002 AND INP003 FEED TKAR0 AND TKAR1, RESPECTIVELY. THESE TWO 0-TYPE FLIP-FLOPS CONTROL TRACK SELECTION USING A 2-BIT BINARY CODE. NOTE THAT TKAR0 ONLY ALLOWS A CHANGE IN TRACK SELECTION WHEN THE TRANSPORT IS IN A STOP STATE, THAT IS, MNT000 IS IN A LOW STATE.

PRIMARY STATUS OF THE CONTROLLER IS GENERATED BY A DISCRETE GATE ENCODER. SEVEN OF THE MOTION COMMANDS, WRITE TWO, WRITE, READ-ONE-BLOCK, READ, FAST FORWARD, BACKSPACE, AND FAST REVERSE, ARE SELECTED BY GATES W000E, M000E, R0BLOC, FEED, FEED0, R0BLOC, AND R0BLOC, RESPECTIVELY. INPUTS B000E AND B000E ARE THE OUTPUT OF A FLIP-FLOP LOCATED ON J001 WHERE B000E IS IN A HIGH STATE WHEN ONLY ONE BLOCK IS TO BE READ, THAT IS A READ-ONE-BLOCK OR A BACKSPACE COMMAND HAS BEEN ISSUED. (BACKSPACE IS ESSENTIALLY A REVERSE READ OPERATION, EXCEPT THAT NO DATA IS TRANSFERRED.) OUTPUTS FROM THESE SEVEN GATES, WHICH INDICATE THE OPERATING MODE OF THE TRANSPORT, SELECTIVELY FEED STAT1, STAT1, AND STAT1. THE OUTPUTS OF THESE THREE GATES GENERATE A 3-BIT CODE WHICH IS GATED THROUGH INP000A, INP000A, AND INP000A BY STAT1. OUTPUTS FROM THESE THREE GATES RECREATE THE ORIGINAL STATES, ON 2/PA LEADS INP000, INP000, AND INP000, WHICH WERE PRESENT WHEN THE COMMAND WAS ISSUED FROM THE PARALLEL BUS. STAT1 IS ACTIVE OR IN A HIGH STATE WHEN THE BUS IS PREPARED TO RECEIVE A REPLY FROM THE CONTROLLER.

CHOOD INDICATES WHETHER THE CONTROLLER IS IN A STOP STATE. ITS OUTPUT IS IN A HIGH STATE WHENEVER THE TRANSPORT IS EITHER STOPPED OR IN THE PROCESS OF STOPPING. WHEN A STOP COMMAND IS ISSUED, INPUT INP000, WHICH IS AN OUTPUT FROM J001, GOES LOW IMMEDIATELY AND REMAINS LOW UNTIL ST00P GOES LOW. ST00P GOES LOW ONLY AFTER THE TRANSPORT HAS REACHED AN END OF THE TAPE AND WILL REMAIN LOW UNTIL THE TRANSPORT HAS REACHED A COMPLETE STOP, APPROXIMATELY 40 ns. AS STATED EARLIER, THE LEADING EDGE OF ST00P CLEARS MNT000 WHICH CAUSES MNT000 TO GO LOW. THE OUTPUT OF CHOOD WILL REMAIN IN A HIGH STATE UNTIL MNT000 IS DRIVEN HIGH AGAIN.

SINCE A REWIND OPERATION OF THE TRANSPORT IS NOT NORMALLY STOPPED BY THE CONTROLLER, PROVISIONS WERE MADE IN THE STATUS CIRCUITRY WHERE MNT000, CAN OVERDRIVE THE STOP (OR STOP) STATE OF CHOOD. IF THE TRANSPORT IS IN A REWIND MODE, INP000E OR WILL BE IN A LOW STATE. THIS DISABLES THE OUTPUT OF MNT000 TO GO HIGH, IRRESPECTIVE OF THE STATE OF CHOOD. GATING OF MNT000 THROUGH INP000E COMPLETES THE 4-BIT CODE WHICH INDICATES THE FUNCTIONAL STATUS OF THE TRANSPORT.

THE OUTPUT OF TKAR0 FEED INP000A AND INP000A, AND THE OUTPUT OF TKAR1 FEED INP000A AND INP000A. THESE FOUR GATES INDICATE THE STATUS OF THE TRACK SELECTION WHEN STAT1 IS ACTIVE. INP000E, INP000E, AND INP000E ARE DRIVEN LOW BY LEAD MNT000 WHEN A STATUS IS REQUESTED FROM THE TAPE CONTROLLER. THESE GATES DRIVE 2/PA LEADS INP000, INP000, AND INP000, WHICH ARE THE ACTIVE 3 BITS OF THE TAPE CONTROLLER'S 3-V6 DEVICE CODE.

INPUT INP001 IS USED TO INITIALIZE THE CONTROLLER CIRCUITS. THE OUTPUT FROM INP001 RESETS THE 3-V6 AND 0-TYPE FLIP-FLOPS, MNT000, MNT000, AND MNT000, RESETS R0BLOC, R0BLOC, AND MNT000, WHICH COMPLETES INITIALIZATION OF J001. MNT000, MNT000, AND MNT000 ARE EITHER A MAINTENANCE COMMAND (PULSE ON MNT000) OR A MAINTENANCE STOP COMMAND (PULSE ON ST00P WHILE ST00P IS IN A LOW STATE). IT IS RESET BY EITHER A RESET MAINTENANCE COMMAND (PULSE ON MNT000) OR A PULSE ON INP001. A LOW LEVEL FROM MNT000 GATING ST00P WILL INHIBIT ALL INPUTS TO THE TRANSPORT AND UNDOES NORMAL OPERATING CONDITIONS, CAUSE THE TRANSPORT TO STOP. SETTING OF THIS MAINTENANCE COMMAND BY A MAINTENANCE STOP COMMAND (PULSE ON MNT000) IS IN A HIGH STATE, MNT000 GOES LOW. WHEN MNT000 IS IN A HIGH STATE, MNT000 GOES LOW. THIS WILL DISABLE THE TRANSPORT AND STOP MOTION. THIS PULSE IS THE COMMAND LEAD FOR A LOW LEVEL ON INPUT INP000 AND A LOW PULSE ON MNT000 (RESET MAINTENANCE COMMAND).

J001 CIRCUIT PACK

BELL TELEPHONE LABORATORIES

CPS-JK16
SHEET 4